

# Comparison of inclusive jets and dijets — ATLAS & CMS

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LHC EW WG – Jets and EW bosons

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# Aim

**Assess compatibility of different inclusive jet, dijet and  $b$ -jet measurements at 7 TeV.**

Use Monte-Carlo calculations as transfer function to compare consistency of different measurements.

**⇒ since different measurements use different fiducial phase space definitions, differences in description of different measurements may also stem from different levels of mismodelling in different phase space regions**

## Tools – NLOs

### POWHEG+PYTHIA8

Alioli et.al. [arXiv:1012.3380](https://arxiv.org/abs/1012.3380)

- $\mu_{R/F} = p_T^j$  (underlying Born)
- NNPDF 3.0 NNLO  
 $\alpha_s(m_Z) = 0.118$
- generation cuts  
 $p_T^j > 15 \text{ GeV}$
- PYTHIA:  
CUETp8M1 tune  
w/ NNPDF 2.1 LO

⇒ **generated by H. Jung**

### SHERPA (S-Mc@NLO)

Höche, MS [arXiv:1208.2815](https://arxiv.org/abs/1208.2815)

- $\mu_{R/F} = \frac{1}{4} H_T$ ,  $\mu_Q = \frac{1}{2} p_T^j$
- NNPDF 3.0 NNLO  
 $\alpha_s(m_Z) = 0.118$
- generation cuts  
 $p_T^j > 15 \text{ GeV}$
- non-perturbative:  
default tune  
w/ NNPDF 3.0 NNLO

⇒ **generated by S. Kuttimalai**

still limited statistics,

use results of [arXiv:1012.3380](https://arxiv.org/abs/1012.3380) (where available) w/ CT10 NLO PDF here

# Analyses

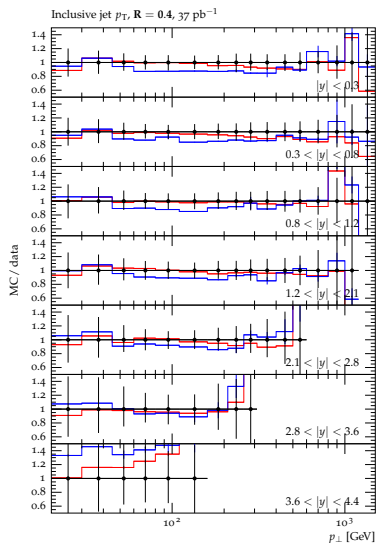
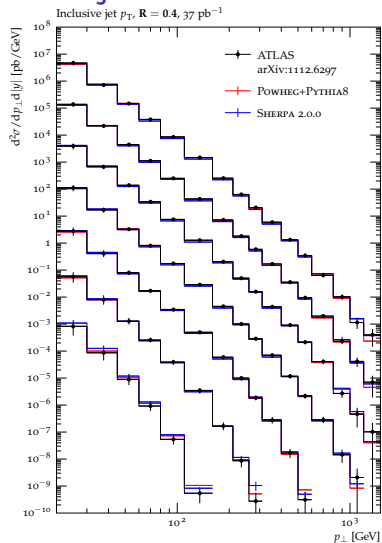
## ATLAS

- inclusive jets  
arXiv:1410.8857 (4.5 fb<sup>-1</sup>,  $R = 0.4, 0.6$ ,  $p_T > 100$  GeV,  $|y| < 3$ )  
arXiv:1112.6297 (37 pb<sup>-1</sup>,  $R = 0.4, 0.6$ ,  $p_T > 20$  GeV,  $|y| < 4.4$ )
- dijets  
arXiv:1312.3524 (4.5 fb<sup>-1</sup>,  $R = 0.4, 0.6$ ,  $p_T > 100/50$  GeV,  $|y| < 3$ )  
arXiv:1112.6297 (37 pb<sup>-1</sup>,  $R = 0.4, 0.6$ ,  $p_T > 30/20$  GeV,  $|y| < 4.4$ )
- *b*-jets  
arXiv:1109.6833 (34 pb<sup>-1</sup>,  $R = 0.4$ ,  $p_T > 20$  GeV,  $|y| < 2.1$ )

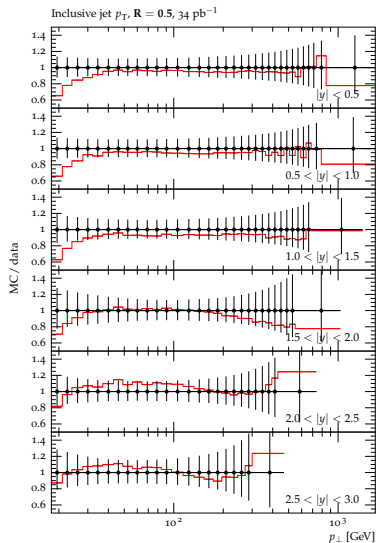
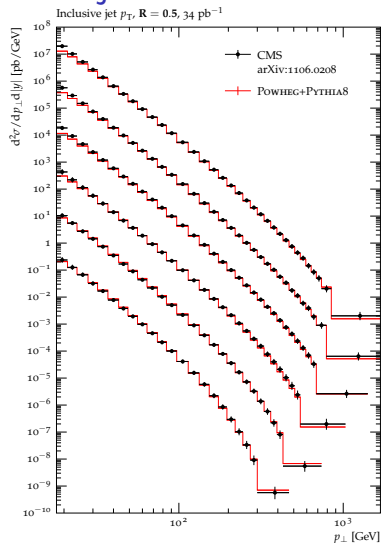
## CMS

- inclusive jets  
arXiv:1106.0208 (34 pb<sup>-1</sup>,  $R = 0.5$ ,  $p_T > 18$  GeV,  $|y| < 3$ )
- *b*-jets  
arXiv:1202.4617 (34 pb<sup>-1</sup>,  $R = 0.5$ ,  $p_T > 18$  GeV,  $|y| < 2.4$ )

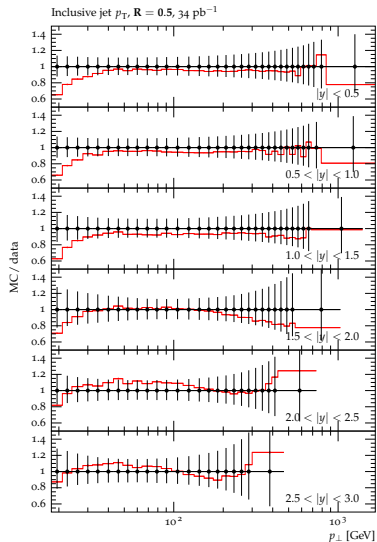
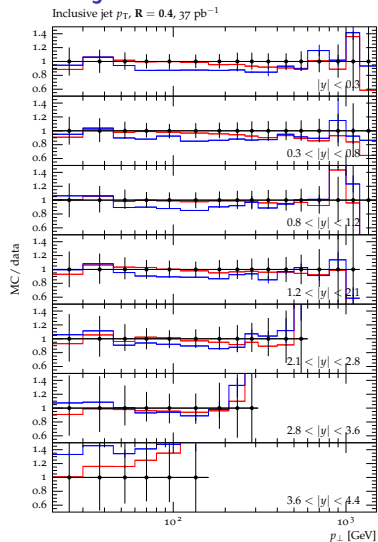
# Inclusive jets



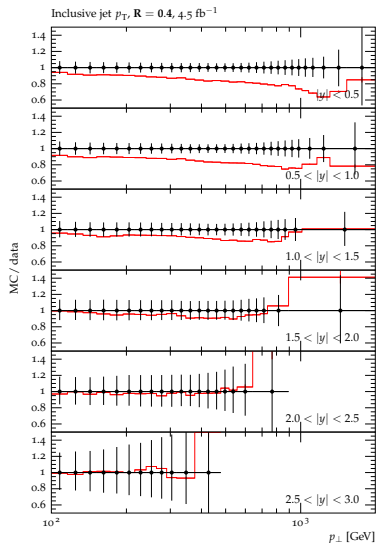
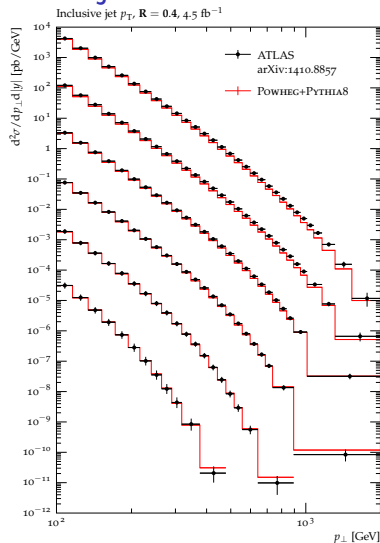
# Inclusive jets



# Inclusive jets

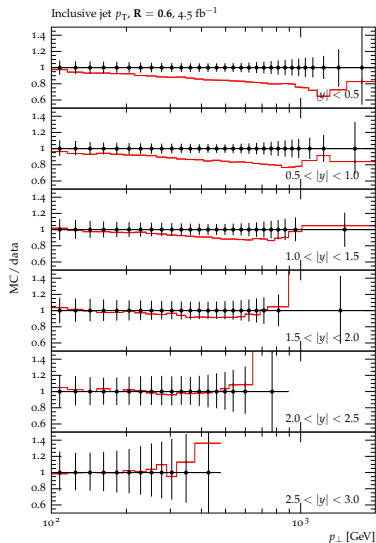
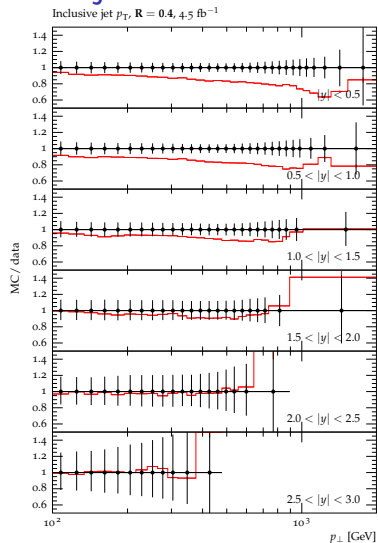


# Inclusive jets

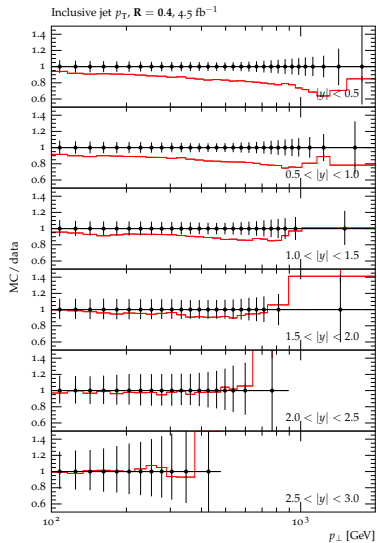
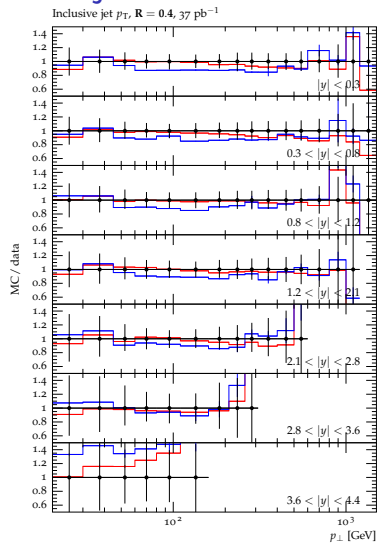




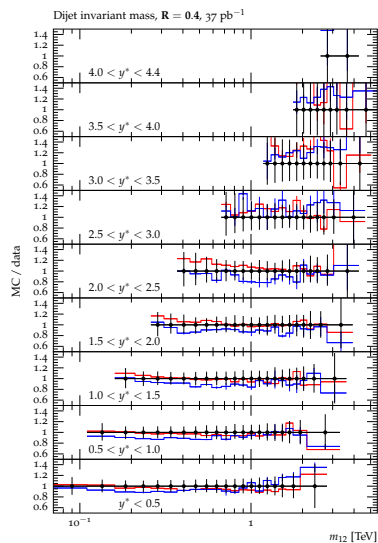
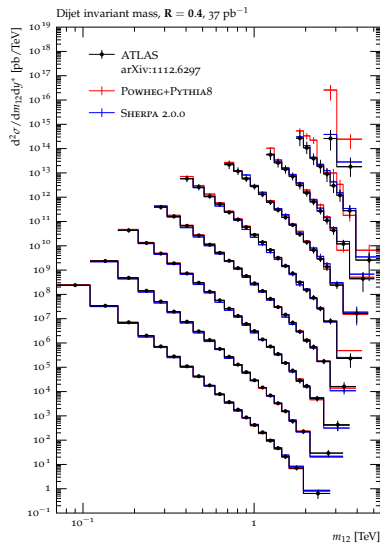
# Inclusive jets



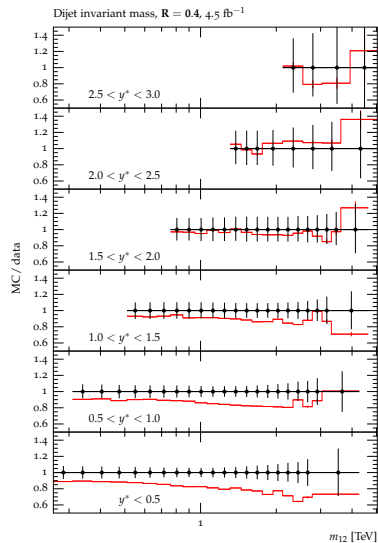
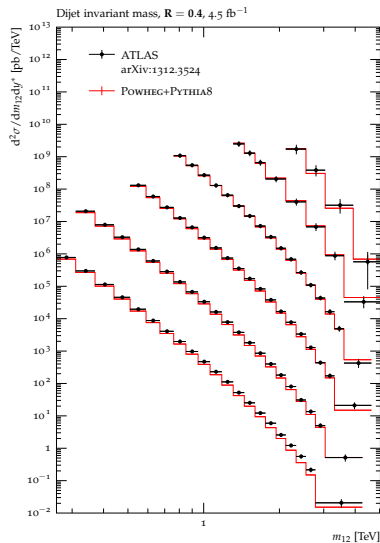
# Inclusive jets



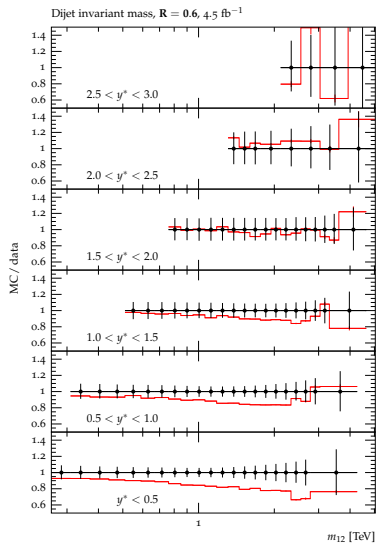
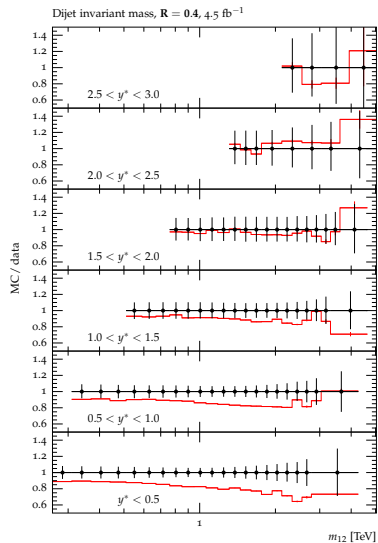
## Dijets



# Dijets



## Dijets



## Conclusions

- Monte-Carlo calculations used as transfer function to compare consistency of different measurements  
⇒ **since different measurements use different fiducial phase space definitions, differences in description of different measurements may also stem from different levels of mismodelling in different phase space regions**
- ATLAS and CMS measurements seem consistent for inclusive jet  $p_T$  and dijet invariant mass spectra for low luminosity data
- systematic differences in ATLAS data between  $37 \text{ pb}^{-1}$  and  $4.5 \text{ fb}^{-1}$ , independent of jet radius
- no CMS results for full 7 TeV data set included
- no CMS results for dijet invariant mass included
- $b$ -jet data also seems consistent between ATLAS and CMS

Full results [here](#).

# Backup

# POWHEG+PYTHIA8 settings

```
bornktmin 15d0 ! default 0d0
bornsuppfact 600d0 ! default 0d0
withnegweights 1 ! default 0
facscfact 1 ! default 1
renscfact 1 ! default 1
doublefsr 1 ! default 0
```

```
POWHEG:veto = 1
POWHEG:vetoCount = 3
POWHEG:pThard = 2
POWHEG:pTemt = 0
POWHEG:emitted = 0
POWHEG:pTdef = 1
POWHEG:MPIveto = 0
ParticleDecays:limitTau0 = on
Tune:ee = 7 ! Monash 2013 tune
Tune:pp = 14 ! Monash 2013 tune
tune CUETp8M1: CMS tune based on
NNPDF2.1LO
```